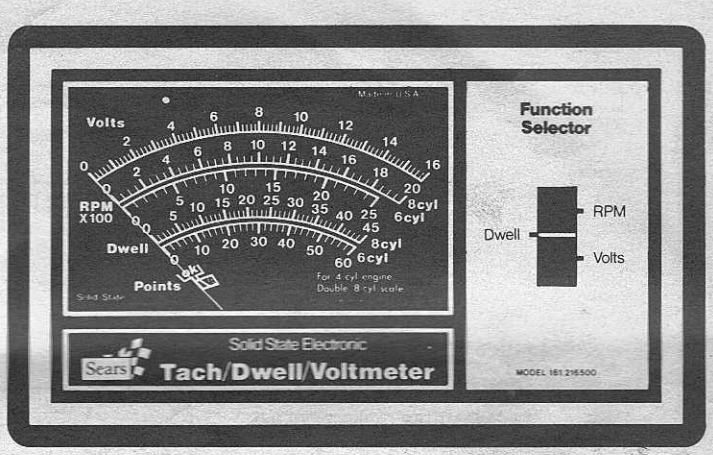
Sears

owners manual



MODEL NO. 161.216500

Tach/Dwell/Voltmeter

FOR 12 VOLT ELECTRONIC OR CONVENTIONAL IGNITION SYSTEMS

OPERATING INSTRUCTIONS

SAFETY RULES

TUNE-UP PROCEDURES

REPAIR PARTS

Caution:
Read Rules For Safe Operation and Complete Operating Test Procedures Carefully

SEARS,ROEBUCK AND CO. U.S.A.
CHICAGO,ILLINOIS 60684

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IMPORTANT

The information in this manual will serve as a general guide for engine tune-up and charging system tests and adjustments.

CONSULT THE VEHICLE SERVICE MANUAL FOR SPECIFIC TUNE-UP INFORMATION AND TEST PROCEDURES. ALWAYS FOLLOW THE MANUFACTURER'S SPECIFICATIONS AND TEST PROCEDURES FOR ADJUSTING DWELL ANGLE, IDLE SPEED AND CHARGING SYSTEM OUTPUT, ESPECIALLY VEHICLES WITH MODERN ELECTRONIC IGNITION AND EMISSION CONTROLS. DO NOT ATTEMPT TO SERVICE VEHICLE WITHOUT MANUFACTURER'S INSTRUCTIONS.

SOURCES FOR SERVICE INFORMATION

The following is a list of publishers who have service manuals for your specific vehicle at nominal cost. Write to them for availability and prices, specifying the make, style, and model year of your vehicle.

A. E. A. Tune-Up Charts
Automotive Electric Assn.
1301 W. 22nd St., Suite 202
Executive Plaza Building
Oak Brook, Illinois 60521

Chilton's Auto Repair Manual
Chilton Company
56th and Chestnut Streets
Philadelphia, Pennsylvania 19139

GM Diagnosis and Repair Manual
GM DR Manual Headquarters
P.O. Box 1185
Southfield, Michigan 48075

Motor's Auto Repair Manual
250 W. 55th Street
New York, New York 10019

National Service Data Book
National Automotive Service, Inc.
Div. Glenn Mitchell Manuals, Inc.
Box 10465
San Diego, California 92110

Chrysler Corporation
Service Publications Dept.
26001 Lawrence Ave.
Center Line, Michigan 48015

Helm Incorporated
P.O. Box 07150
Detroit, Michigan 48207

90-DAY WARRANTY

IF, WITHIN 90 DAYS FROM THE DATE OF PURCHASE, THIS AUTOMOTIVE TEST INSTRUMENT FAILS DUE TO A DEFECT IN MATERIAL OR WORKMANSHIP, RETURN IT TO THE NEAREST SEARS STORE THROUGHOUT THE UNITED STATES, AND SEARS WILL REPAIR OR REPLACE IT, FREE OF CHARGE.

THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE.

SEARS, ROEBUCK AND CO.
DEPARTMENT 698/731A
SEARS TOWER
CHICAGO, IL 60684

RULES FOR SAFE AUTOMOTIVE TESTING
READ CAREFULLY

1. Read this Owner's Manual and these Rules for Safe Automotive Testing carefully. Failure to follow instructions and safety rules could result in serious bodily injury and/or damage to the instrument.
2. Before starting the engine, set the parking brake and place gear selector in NEUTRAL on standard transmissions or PARK on automatic transmission.
3. The carbon monoxide in exhaust gas is highly toxic. To avoid asphyxiation, always operate vehicle in a well-ventilated area. If vehicle is in an enclosed area, exhaust should be routed directly to the outside via leakproof exhaust hose.
4. When operating any test instrument from an auxiliary battery, connect a jumper wire between the negative terminal of the auxiliary battery and chassis ground on the vehicle under test for negative ground systems. For positive ground systems, connect the jumper wire to the positive terminal of the auxiliary battery and chassis ground on the vehicle. When working in a garage or other enclosed area, auxiliary battery should be located at least 18 inches above the floor to minimize the possibility of sparks igniting gasoline vapors and causing an explosion.
5. An automobile battery is capable of producing very high currents. Therefore, exercise reasonable care when working near the battery to avoid electrical connections through tools, wristwatch, etc.
6. Avoid contact with battery electrolyte. It can eat holes in clothing, burn skin and cause permanent damage to eyes. Always wear splash proof safety goggles when working around the battery. If battery electrolyte is splashed in the eyes or on skin, immediately flush the affected area for 15 minutes with large quantities of clean water. In case of eye contact, seek medical aid.
7. The gases generated by a charging battery are highly explosive. Do not smoke or permit flame or spark to occur near a battery at any time, particularly when it is charging. Any room or compartment containing charging batteries should be well ventilated to prevent accumulation of explosive gases. To avoid sparks, do not disturb the battery charger connections while battery is charging, and always turn charger off before disconnecting the battery clips. When removing or reconnecting battery cables, make sure ignition switch and all accessories are turned off.
8. Never add acid to a battery once the battery has been placed in service. Doing so may result in dangerous spattering of electrolyte.
9. Keep hands, hair, necktie, loose clothing and test leads well away from fan blade, fan belt, power steering belt, air conditioner belt and other moving engine parts, as serious injury could result from entanglement.
10. Do not touch hot exhaust manifold, radiator or high-voltage spark plug and coil terminals. Spark voltages are not normally lethal but an involuntary jerk of the hands or arms caused by electrical shock may result in injury.
11. Never look directly into carburetor throat while engine is cranking or running. A sudden backfire can cause serious burns.
12. To avoid the possibility of a flash fire, do not smoke or permit flame or spark to occur near carburetor, fuel line, fuel filter, fuel pump or other potential sources of spilled gasoline or gasoline vapors.
13. Never remove radiator cap while the engine is hot. Hot coolant escaping under pressure can cause serious burns.
14. The jack supplied with the vehicle should be used only for changing wheels. Never crawl under car or run engine while vehicle is on jack.
15. When making electrical test connections to the vehicle, do not use the carburetor or other fuel system components as a ground connection, as a spark could ignite the gasoline vapors and cause a fire or an explosion.

GENERAL INSTRUCTIONS

Connections For RPM, Dwell, Volts and Points Tests

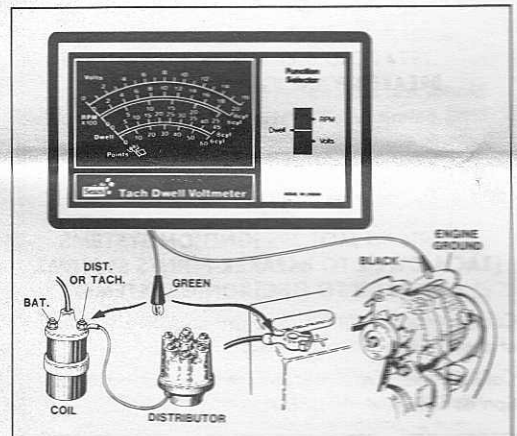
Connect the GREEN Clip to the distributor terminal on the ignition coil or TACH (tachometer) terminal on electronic ignition systems to measure RPM, DWELL or POINTS condition.

Connect the GREEN clip to the battery Positive (+) terminal to measure STARTING AND CHARGING VOLTAGES.

Connect the BLACK clip to a secure ground connection on the engine, frame, or alternator bracket as shown in Figure 1. **The BLACK clip should be the last connection made, and the first to be disconnected.**

CAUTION!

Avoid connecting directly to the Battery Negative Terminal in the event that hydrogen gases are present which could explode from sparking connections.



CONNECTIONS FOR RPM, DWELL, VOLTS AND POINTS TESTS

FIGURE 1

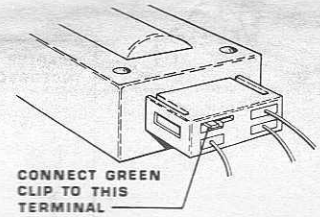
TACHOMETER CONNECTIONS

NOTE: This analyzer is not designed to be used on capacitive-discharge electronic ignition systems to measure RPM and DWELL. If so used, it may indicate incorrect engine speed and dwell readings or may cause the engine to run roughly or stall. However, typically, only a very few import vehicles use this type system. If you are in doubt as to the type system you have, refer to your vehicle manual.

TACHOMETER CONNECTIONS TO GENERAL MOTORS DELCO HIGH ENERGY IGNITION SYSTEMS

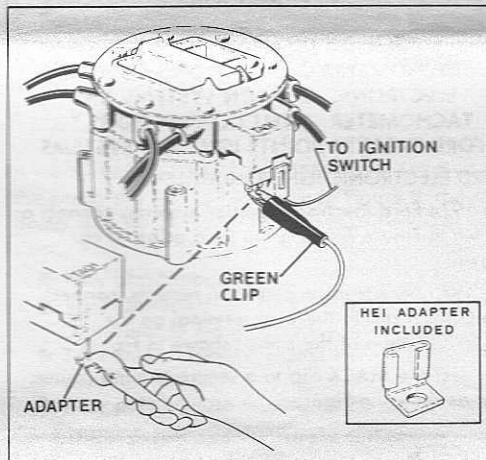
On 4 cylinder and in-line 6 cylinder engines with a separate coil, connect the GREEN clip to the open TACH terminal as indicated in Fig. 2. On the integral coil V-8 or V-6 HEI Systems, slide the adapter onto the TACH terminal as shown in Fig. 3. Then connect the GREEN clip to the adapter.

The BLACK clip must be connected to a secure ground connection as shown in Figure 1.



DELCO HEI WITH SEPARATE COIL
4 Cylinder and In-line 6 Cylinder Cars

FIGURE 2



DELCO HEI WITH INTEGRAL COIL
V-6 and V-8 HEI SYSTEMS

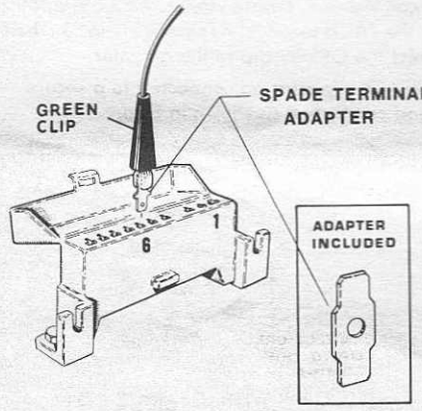
FIGURE 3

TACHOMETER CONNECTIONS TO GENERAL MOTORS CARS WITH DIAGNOSTIC CONNECTOR AND DELCO HIGH ENERGY IGNITION SYSTEMS

To make RPM tests, locate the Engine Electrical Diagnostic Connector (usually near the left front fender). Open the cover and insert the adapter in

socket No. 6 as shown in Figure 4. Connect the GREEN clip to the spade terminal adapter.

The BLACK clip must be connected to secure ground connection as shown in Figure 1.



TACHOMETER CONNECTIONS TO GENERAL MOTORS CARS WITH DIAGNOSTIC CONNECTOR AND DELCO HIGH ENERGY IGNITION SYSTEMS

FIGURE 4

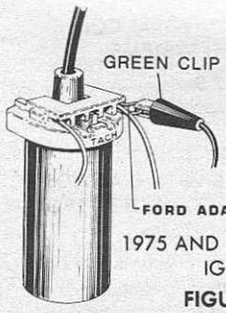
TACHOMETER CONNECTIONS TO FORD ELECTRONIC IGNITION SYSTEMS AND TACHOMETER/DWELL CONNECTIONS TO FORD BREAKER POINTS IGNITION SYSTEMS

FORD ELECTRONIC IGNITION SYSTEMS

On 1974 Ford Electronic ignition systems, connect as shown in Figure 6, using the Ford adapter as shown.

On 1975 Ford transistor ignition systems, connect the GREEN clip to the wire terminal on the "DEC" or "TACH" side of the coil as shown in Figure 5.

Connect the BLACK clip to a secure ground connection as shown in Figure 1.



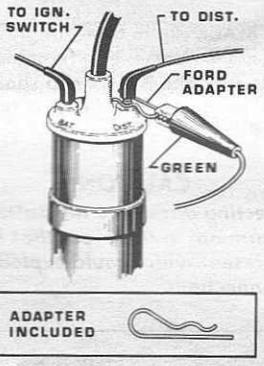
1975 AND LATER FORD ELECTRONIC IGNITION SYSTEMS

FIGURE 5

FORD BREAKER-POINTS IGNITION SYSTEMS

Lift the distributor terminal and slide the FORD adapter clip in place as shown in Figure 6, then push the terminal down on it. Remove when the tests are finished.

Connect the BLACK clip to a secure ground connection as shown in Figure 1.



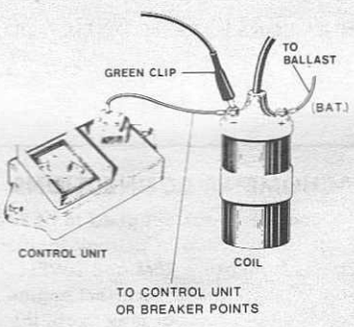
1974 FORD ELECTRONIC AND ALL BREAKER-POINT IGNITION SYSTEMS

FIGURE 6

TACHOMETER CONNECTIONS TO CHRYSLER AND AMERICAN MOTORS IGNITION SYSTEMS (TACH/DWELL TO BREAKER-POINTS SYSTEMS AND TACH TO ELECTRONIC SYSTEMS)

Connect the GREEN lead to the negative terminal of the ignition coil as shown in FIGURE 7.

Connect the BLACK clip to a secure ground connection as shown in FIGURE 1.



CHRYSLER AND AMERICAN MOTORS CONVENTIONAL AND TRANSISTOR IGNITION SYSTEMS

FIGURE 7

TACHOMETER - ENGINE RPM MEASUREMENT PROCEDURE

Connect the BLACK and GREEN leads of the TACH/DWELL/VOLTMETER as described on pages 3 and 4 for the particular engine you are trouble-shooting.

Place the FUNCTION SELECTOR Switch to the RPM position.

Start the engine and operate it at idle RPM. As illustrated in Figure 1, observe the upper RPM scale (0-20) for 8 cylinder engines, and the lower RPM scale (0-25) for 6 cylinder engines. Multiply the indicated number by 100 to obtain the actual engine speed in RPM.

NOTE: For 4 cylinder engines, multiply the 8 cylinder scale by 200 to obtain the actual engine speed in RPM.

Engine DWELL and Timing may now be performed at the engine speed specified in your vehicle owner's manual.

BREAKER POINTS RESISTANCE TEST

(This procedure is not for electronic ignition systems).

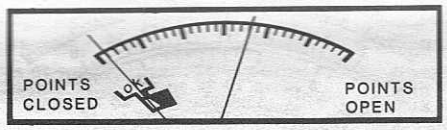
During engine tune-ups or repair, this test should be done **before** adjusting the engine timing (that is, changing the advance or retard of the distributor) or breaker-points DWELL time.

NOTE: Remove the distributor cap and inspect the breaker points. Properly adjusted breaker points become light gray in color during normal use. If they are blued, blackened or pitted, they have exceeded their normal life, or excessive current has been present in the primary circuit. Check for excessively low coil resistance (shorted turns) low ballast resistor value and high battery voltage while the engine is running. Correct any of the above problems, replace the breaker points and proceed to the next step. If the breaker points pass the visual inspection test, also proceed to the next step.

1. The engine must be OFF. The test leads must be connected as shown in Figure 1; GREEN clip to "DIST."
2. Set the FUNCTION SELECTOR knob to the VOLTS position.
3. Replace the distributor cap and REMOVE THE HIGH TENSION LEAD FROM THE CENTER OF THE DISTRIBUTOR CAP AND GROUND IT BY CONNECTING THE LOOSE END TO THE ENGINE OR FRAME.

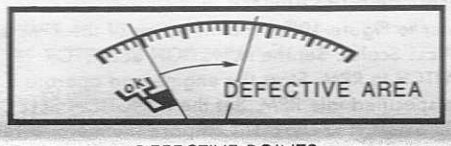
NOTE: When testing a vehicle with dual points, alternately block one set of points open with a piece of insulating material while the other set is being tested.

4. TURN THE IGNITION KEY ON. If the meter reads near full scale (right), the points are open as shown in Figure 8. Crank the engine a fraction of a revolution at a time until the meter reads in the left hand area of the scale, as shown in Figure 8. The points are now closed.
5. TEST RESULTS



POINTS OK

FIGURE 8



DEFECTIVE POINTS

FIGURE 9

If the meter indicates in the DEFECTIVE AREA when the points are closed, as shown in Figure 9, the points may be defective or the following faults may exist:

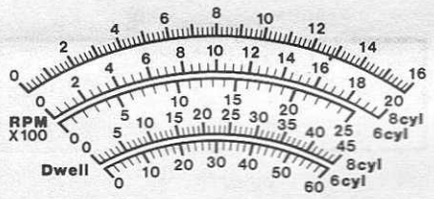
- Poor distributor ground.
- Poor connection on the primary lead from the distributor to the ignition coil.
- Defective distributor pigtail lead.
- Misaligned points
- Poor points/plate ground inside distributor.

Correct the defect and repeat the test.

BREAKER-POINTS-DWELL TEST AND ADJUSTMENT

NOTE: This test and adjustment procedure is performed on cars with conventional breaker-points ignition systems and transistorized ignition systems with breaker points such as some after-market units. This procedure is not to be used on vehicles equipped with various all-electronic ignition systems or capacitive-discharge systems.

Before performing the DWELL TEST and ADJUSTMENT procedure, read the vehicle owner's manual or the engine compartment decal to determine what should be done with the vacuum hose connected to the distributor and the advance/retard solenoids. Most often, the vacuum hose must be disconnected from the distributor as shown in Figure 11 and the end plugged with a golf "tee" or plug.



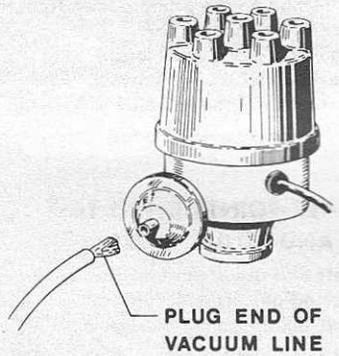
RPM AND DWELL SCALES

FIGURE 10

DWELL MEASUREMENTS

Refer to Figure 10 for identification of the RPM and DWELL Scales. Set the FUNCTION SELECTOR SWITCH to RPM. Start the engine and operate it at the specified idle RPM. Set the FUNCTION SELECTOR SWITCH to DWELL. Compare the meter dwell angle reading with the manufacturer's specification for the engine. If the dwell reading is higher or lower than the manufacturer's specification, adjust the distributor points as illustrated below and described in the following sections.

For 4 cylinder engines, multiply the 8 cylinder RPM scale by 200 and the 8 cylinder Dwell scale by 2.



DISTRIBUTOR VACUUM HOSE CONNECTION

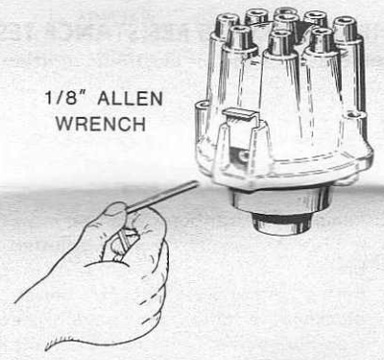
FIGURE 11

DWELL ADJUSTMENT-
CONVENTIONAL BREAKER POINT SYSTEMS

On GM distributors with a small metal slide cover, lift the cover and insert a 1/8" Allen wrench in the adjusting screw socket and adjust the dwell by turning the wrench, as shown in Figure 12.

On Ford, Chrysler, American Motors and other distributors not equipped with a small metal access slide cover, perform the following steps while referring to Figure 13.

1. Remove coil wire from center tower of distributor cap and ground the wire by connecting the loose end to the engine or frame.
2. Remove the distributor cap and rotor.
3. Connect a remote starter switch to the vehicle or have an assistant crank the engine for you.
4. With ignition switch ON and engine cranking observe reading on the Dwell scale.



TYPICAL GENERAL MOTORS
BREAKER-POINTS DISTRIBUTOR

FIGURE 12

5. To adjust Dwell, loosen the locking screw slightly and adjust the point gap with a feeler gauge according to the procedure outlined in the vehicle's service manual. After adjustment, tighten locking screw, and recheck dwell while cranking engine. Repeat procedure if necessary. (FIG. 13).
6. Reassemble distributor and recheck dwell reading with engine operating at idle speed.

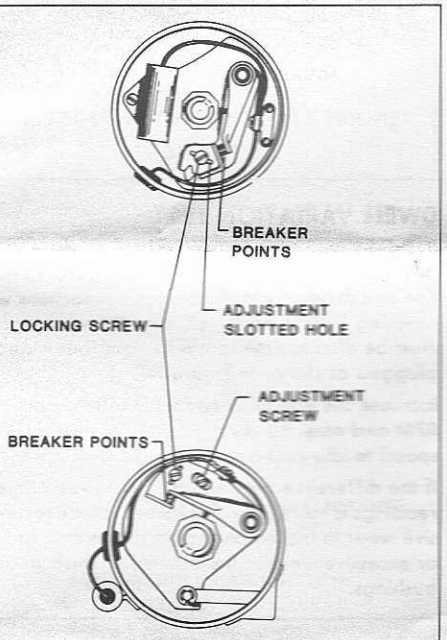
   Repeat steps 5 and 6 if necessary.

DWELL READINGS-
ELECTRONIC AND TRANSISTOR IGNITIONS

Due to the vast array of electronic ignition and engine control systems being used on late model

cars, it is essential that specific service information for the vehicle under test be obtained. Although dwell angle is not adjustable on electronic systems, the reading obtained is important and should be within the manufacturer's specified limits. If it is not, consult the manufacturer's shop manuals for diagnostic procedures and possible component replacement instructions.

To measure the DWELL angle on electronic ignition systems, set the FUNCTION SELECTOR SWITCH to RPM. Start the engine and operate it at the specified idle RPM. Set the FUNCTION SELECTOR SWITCH to DWELL. Compare the meter dwell angle reading with the manufacturer's specifications for the engine. If the reading is higher or lower than the recommended value, consult the owner's manual, diagnostic procedures, for your particular vehicle to correct the problem.



TYPICAL FORD, CHRYSLER, AND AMERICAN MOTORS BREAKER-POINT DISTRIBUTORS

FIGURE 13

ENGINE TIMING

The engine should be timed at each tune-up after the dwell adjustment, but before idle speed and mixture adjustments are made.

Check your owners manual for the location of the timing marks and the timing specifications. Refer to Figure 14. Then use a timing light to time the engine to specifications.

Connect the Timing Light to the battery and engine in accordance with the instructions supplied with the instrument or as shown in Figure 15.

Timing lights recommended for best service are the Sears Craftsman bright chrome Models 2194 (advance timing light) and 2134 — both accurate to 8000 RPM.

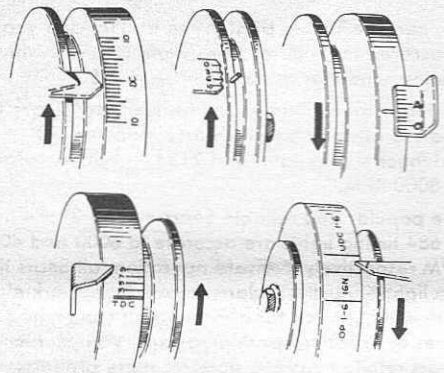
The popular and reliable Sears models 21174 and 21684 timing lights are accurate to 6000 and 4000 RPM respectively. For safe operation, all Sears timing lights inductively clamp around the spark plug wire without need for disconnecting high voltage wires or exposing spark plug caps. Visit your local Sears retail or catalog store for these products.

PRELIMINARY

1. Check the distributor dwell angle and adjust to the manufacturer's specifications, if necessary, before timing the engine.
2. Clean the dirt from the timing marks.
3. Disconnect the vacuum advance hose from the distributor and seal the end of the hose with tape or a plug as shown in Figure 16.

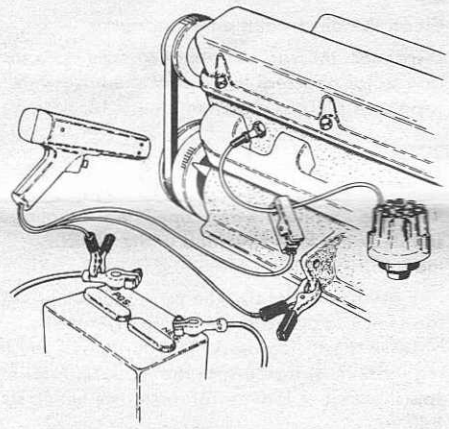
PROCEDURE

1. Start the engine and allow it to warm up.
2. After the engine is warm, operate it at idling speed or the RPM specified in the vehicle manual.
3. Aim the timing light at the timing marks, press the switch to operate the timing light and observe the timing mark. The position of the timing mark must agree with the manufacturer's specification. If it does not, reset the timing as follows:
4. Loosen the distributor hold-down clamp JUST enough to permit rotating the distributor body by hand as shown in Figure 16.
5. Slowly turn the distributor in the correct direction as shown in Figure 17:
   a. **Against** the rotor rotation to advance the timing.
   b. **With** the rotor rotation to retard the timing.
6. Repeat Step 3.
7. When the specified mark is in line with the timing line, securely tighten the distributor hold-down clamp and recheck timing.
8. Check the idle RPM after the engine is timed and re-adjust to the manufacturer's specification if necessary.
9. Remove the plug from the vacuum hose and attach it to the distributor diaphragm connection.



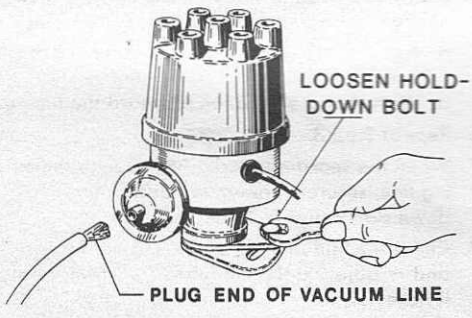
VARIOUS TIMING MARK CONFIGURATIONS

FIGURE 14



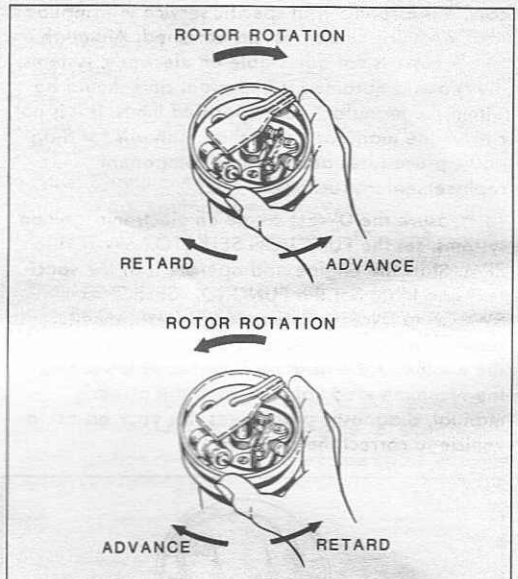
TYPICAL TIMING LIGHT USAGE

FIGURE 15



LOOSENING THE HOLD-DOWN CLAMP

FIGURE 16



ENGINE TIMING ADJUSTMENT PROCEDURE

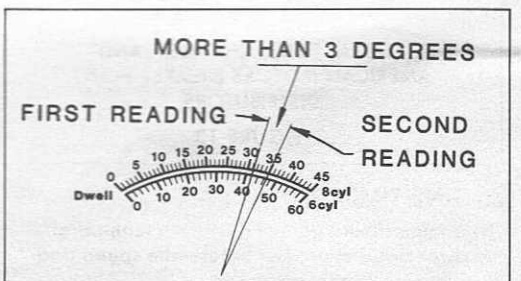
FIGURE 17

DWELL VARIATION TEST

Read the owner's manual or engine compartment decal and follow the instructions regarding vacuum line or advance-retard solenoid connections when checking DWELL angle. Usually, the vacuum hose must be disconnected from the distributor and plugged as shown in Figure 20.

Increase the engine speed from idle to about 1500 RPM and note the dwell angle. Return the engine speed to idle and again note the dwell angle.

If the difference between the two dwell angle readings is more than 3 degrees, check for excessive wear in the breaker point plate and couplings or excessive wear in the distributor shaft gear and bushings.



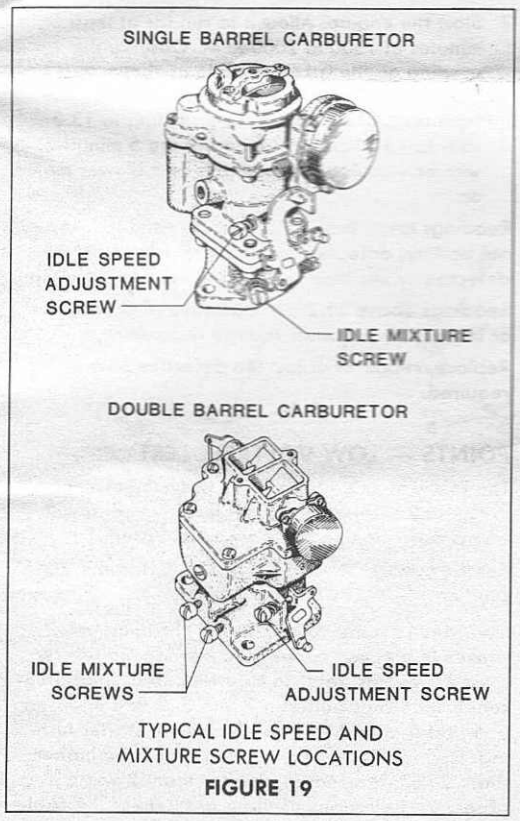
DWELL VARIATION

FIGURE 18

IDLE SPEED AND CARBURETOR ADJUSTMENT

1. The engine should be at normal operating temperature for this test. Many cars built in 1970 and later have idle mixture screw limiter caps that restrict adjustment. On these cars the carburetor should be adjusted according to the procedure in the manufacturer's service manual.
2. Shut the engine off and connect the test leads as shown in FIGURE 1 or for Electronic Ignition Systems and late model cars, see FIGURES 1, 2, 3, 4, 5, 6, and 7. Set the FUNCTION SELECTOR Knob to the RPM position.
3. Consult the manufacturer's service manual for the location of the idle speed adjusting screw and the idle mixture adjusting screw (or screws). Make idle speed and mixture adjustments according to the procedure outlined in the service manual or as specified on the decal in the engine compartment.

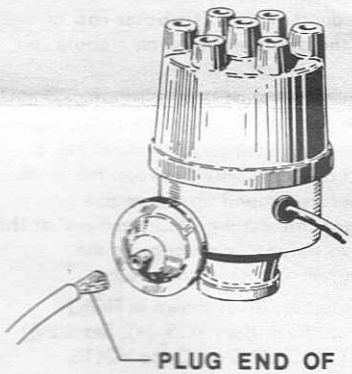
   Figure 19 illustrates typical locations of the idle speed and idle mixture screws on single and multi-barrel carburetors.



TYPICAL IDLE SPEED AND MIXTURE SCREW LOCATIONS

FIGURE 19

4. Start the engine and turn the idle speed screw until specified idle speed is indicated.
5. On engines without exhaust emission control systems, turn the idle mixture screw in (lean) until the idle speed starts to decrease, then turn it back out (rich) just until the idle speed reaches a maximum. Further richening past this point will only waste fuel. This should be done slowly to allow engine speed to stabilize.
6. On multi-barrel carburetors, repeat this procedure on each idle mixture screw until the highest idle speed and smoothest operation is obtained. If the engine idle speed is now higher than the manufacturer's specification, turn the idle speed adjustment screw until the specified idle speed is indicated and readjust the mixture screws with the above procedure.
7. NOTE: On engines equipped with exhaust emission control systems, air injection pumps and positive crankcase ventilation, refer to the decal in the engine compartment or the owners manual for idle adjustment specifications.



DISTRIBUTOR VACUUM HOSE CONNECTION

FIGURE 20

VOLTS-PRELIMINARY CHECKS

The VOLTS switch position is used to test the cranking and charging volts in the vehicle.

CONSULT THE OPERATING MANUAL OF THE VEHICLE BEING TESTED FOR SPECIFIC VOLTAGES AND TEST PROCEDURES:

The following information will serve as a general guide for making charging system tests.

Before making VOLTS tests:

Check the fan belt — it should be tensioned according to the manufacturer's specifications.

Check the generator or alternator pulley and mounting bolts. They should be tight.

Make sure that the charging system wiring and the battery cables are in good condition and that connections are tight. Make sure the battery is clean and that the liquid level in each cell is above the plates.

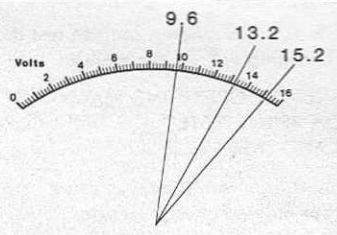
The engine and all parts of the charging system should be at normal operating temperature before making any electrical tests. If the engine is cold, operate the engine at idle speed for at least 15 minutes before making any tests.

CRANKING VOLTS TEST

1. To prevent the engine from starting while cranking, remove the high tension lead from the center of the distributor cap and ground it by connecting the loose end to the engine or frame on systems with a separate coil.

   For systems with integral coil as shown in Figure 3, disconnect the primary wire from the "BAT" terminal on the distributor cap. CAUTION: The TACHOMETER terminal must NEVER be connected to ground **at the distributor cap** as damage to the distributor-ignition module can result.

   For systems with an electrical diagnostic connector as shown in Figure 4, insert the GM diagnostic spade terminal adapter in terminal No. 6 and connect a jumper wire between this terminal and a secure ground on the engine or frame. **Do not** connect the TACH terminal **at the distributor** to ground as damage to the distributor-ignition module can result.
2. Connect the test leads as shown in FIG. 1: GREEN clip to the Battery POS. (+). Set the FUNCTION SELECTOR SWITCH to VOLTS.
3. Operate the starter for 10 seconds and observe the cranking voltage on the 0-16 volts scale as shown in Figure 21. A steady reading of more than 9.6 volts indicates that the battery, cables and starter system are in good condition.



CRANKING AND CHARGING VOLTS TESTS
FIGURE 21

4. A reading below 9.6 volts could be caused by a battery that is defective or not fully charged. Fully charge the battery and repeat the test. If the reading is still below 9.6 volts, either the battery or starter is defective.
5. A fluctuating voltage reading is indicative of a defect in the starter or battery or in the battery-starter wiring circuit. Refer to FIGURE 23, LOW VOLTAGE TEST, for troubleshooting voltage drops in the battery-starter wiring circuit. Replace or repair any defective parts as required to restore cranking system to proper operation.
6. To restart the engine, replace the high tension lead to the center of the distributor cap, replace the wire to the "BAT" terminal of the integral coil distributor, or remove the jumper wire from terminal 6 of the diagnostic connector.

CHARGING SYSTEM VOLTS TEST

1. Connect the test leads as shown in Figure 1; GREEN clip to the Battery POS. (+) terminal. Set the FUNCTION SELECTOR switch to the VOLTS position.
2. Start the engine. Allow it to run for at least 5 minutes at 1500 to 2000 RPM. Observe the reading on the 0-16 volt scale as shown in FIGURE 21. The reading should gradually rise from about 12.5 volts before starting to 13.2 volts to 15.2 volts at the end of the 5 minutes, with or without the headlights and blower motor on.

Readings lower than 13.2 indicate either a worn out battery, defective generator or alternator or defective or improperly adjusted voltage regulator.

Readings above 15.2 are indicative of a defective or improperly adjusted voltage regulator.

Replace, repair or adjust the defective part as required.

POINTS — LOW VOLTAGE TEST

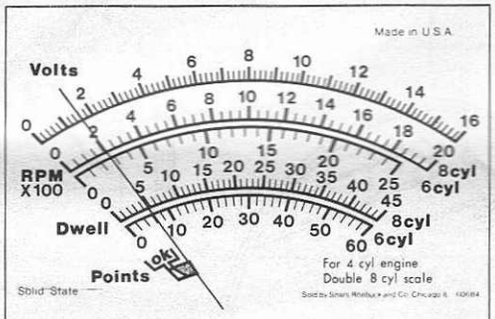
The POINTS scale is also a 0-2 volt range as shown in Figure 22. This scale is useful for checking voltage drops in the vehicle's electrical system.

Set the FUNCTION SELECTOR SWITCH to the VOLTS position.

Corroded or loose connections and frayed or broken cables can cause hard starting. To test for these conditions, refer to Figure 23 and alternately connect the clips between 1 and 2, 2 and 3, 4 and 5, 5 and 6, 6 and 7, 7 and 8 with the starter turning. During this test, no reading should be higher than .2 volt. If a reading higher than .2 volt is observed during any of these tests, check the cable

or connections involved, clean and tighten the connections and replace the cables or solenoid when necessary.

If the meter reads to the left of zero during any of the above tests, reverse the position of the GREEN and BLACK clips.



POINTS AND VOLTAGE SCALES

FIGURE 22

OTHER APPLICATIONS

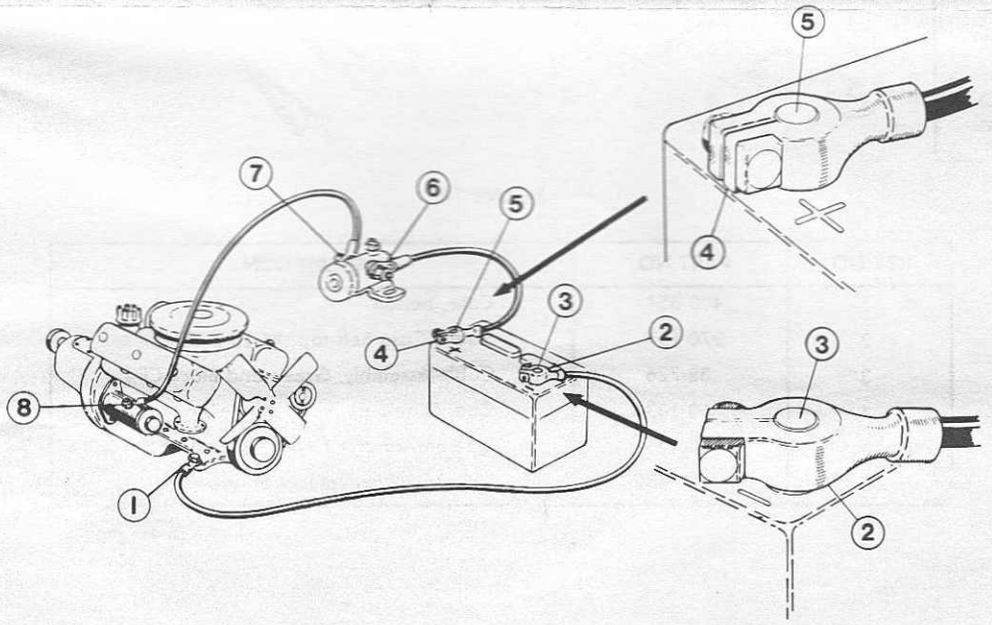
●Foreign Cars

Due to the vast array of different ignition systems found on import cars, it is not possible to cover all applications in a manual of this type. You are recommended to purchase a service manual for your particular vehicle and follow the procedures outlined by the vehicle manufacturers.

●Mazda Rotary Engine

The Mazda has two separate sets of breaker points and two ignition coils. Each set of points must be adjusted individually for dwell angle, normally 55° to 57°. (Consult your vehicle service manual for exact specifications.)

Readings for both Tach and Dwell are the same as for a 4 cylinder engine. When using the model 2165 TACH/DWELL/VOLTMETER, multiply the 8 cylinder Tachometer scale reading by 200 to obtain the actual engine speed in RPM. To measure dwell angle, multiply the 8 cylinder Dwell Angle scale reading by 2.



LOW VOLTAGE TEST

FIGURE 23

REPLACEMENT PARTS

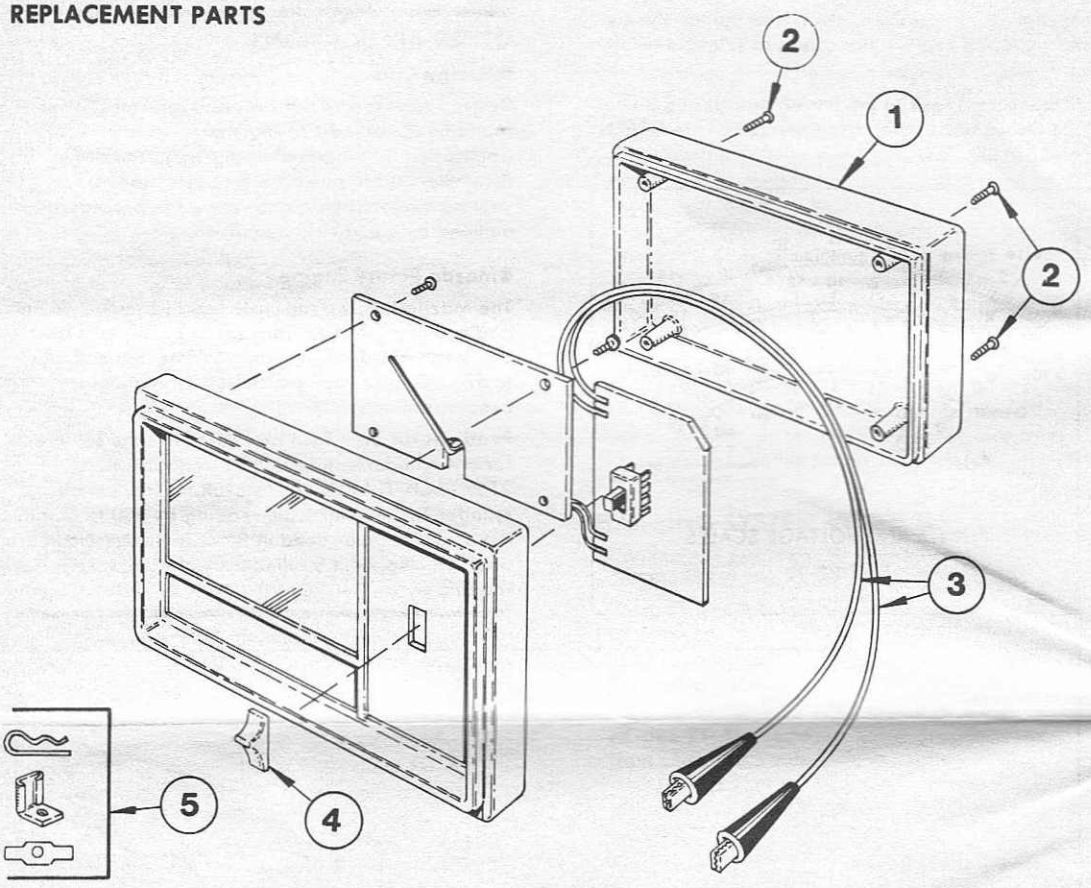


FIGURE 24

KEY NO.	PART NO.	DESCRIPTION
1	400-857	Case, bottom
2	270-117	Screw, Case Self-tap. #6-20 x 1"
3	38-726	Cable Assembly, Green and Black Clip
4	450-133	Cap, Glamour
5	1000-425	Ignition Adapter Kit
*	2-1682	Instruction Manual (not illustrated)

FREQUENTLY USED TUNE-UP INFORMATION

VEHICLE	IDLE RPM	DWELL ANGLE	TIMING	SEARS TUNE-UP KIT #	SPARK PLUG TYPE

notes

Sears

owners manual

MODEL NO. 161.216500

HOW TO ORDER SPARE PARTS

Sears Solid State Electronic

Tach / Dwell / Voltmeter

Now that you have purchased your Tach/Dwell/Voltmeter, should a need ever exist for repair parts or service, simply contact any Sears, Roebuck and Co. store. Be sure to provide all pertinent facts when you call or visit.

The model number of your Tach/Dwell/Voltmeter can be found on the front of the instrument.

WHEN ORDERING REPAIR PARTS, ALWAYS GIVE THE FOLLOWING INFORMATION:

- PART NUMBER
- PART DESCRIPTION
- MODEL NUMBER
- NAME OF ITEM

All parts listed may be ordered from any Sears Service Center and most Sears stores.

If the parts you need are not stocked locally, your order will be electronically transmitted to a Sears Repair Parts Distribution Center for handling.

SEARS,ROEBUCK AND CO. U.S.A.
CHICAGO,ILLINOIS 60684